

## Original Research Article

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# A clinical study of acute intestinal obstruction in adults-based on etiology, severity indicators and surgical outcome

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## ABSTRACT

**Background:** Patients with bowel obstruction still represent some of the most difficult and vexing problems that surgeons face today. While the adage, “never let the sun rise or set on a bowel obstruction” remains true, there has been a trend towards selective non-operative management of this problem. Aims and objectives were to study the various causes and modes of presentation of intestinal obstruction and to evaluate the importance of different severity indicators of obstruction with early recognition, diagnosis and thus timely abdominal exploration.

**Methods:** 2 years prospective study conducted in PDMMC college, Amravati, Maharashtra, India, from September 2013 to September 2015. Each intestinal obstruction patient was evaluated with specific severity indicators, scored and then analyzed.

**Results:** The commonest cause of intestinal obstruction in adults in this study series was adhesions in 33.33% cases. Other causes were mesenteric ischaemia, i.e. 7 (11.67%), Koch's abdomen, i.e. 5 (8.33%), sigmoid volvulus, i.e. 5 (8.33%) and carcinoma, i.e. 5 (8.33%). Resection anastomosis was most commonly performed procedure in 45.7 % cases, followed by adhesiolysis in 14% patients. 66.66% patients having a score less than 3 were managed conservatively, 95.83 % having a score of 3 or more where operated on.

**Conclusions:** The evaluation of patients endeavours not only to confirm the diagnosis but also to determine the need for and timing of surgery. Certain severity indicators and scoring systems can help to optimize this timing of surgery and prevent mortality.

**Keywords:** Adhesions, Intestine, Obstruction, Resection and anastomosis, Scores

## INTRODUCTION

One of the most common intra-abdominal problems faced by general surgeons in their practice remains bowel obstruction. 12% to 16% of acute abdominal emergencies may be contributed to intestinal obstruction. With its multiple etiologies, intestinal obstruction of either the small or large bowel continues to be a major cause of morbidity and mortality.<sup>1</sup> The etiology of bowel obstruction has been varied with small intestinal obstruction caused by adhesions in 60%, strangulated

hernia in 20%, malignancy in 5% and volvulus in 5%.<sup>2</sup> Small bowel obstruction (SBO) is more common and a challenging clinical problem.

Large bowel obstruction (LBO) is most often the result of colorectal malignancies and the lesions usually arise in the sigmoid or rectosigmoid area.<sup>3</sup> Death due to acute intestinal obstruction is decreasing with better understanding of pathophysiology, improvement in diagnostic techniques, fluid and electrolyte correction, much potent anti-microbials and knowledge of intensive

care. Surgical approaches that feature a staged approach may have a better outcome.

The treatment of intestinal obstruction is varied, and has changed greatly during the past two centuries. Early diagnosis of obstruction, skillful operative management, proper technique during surgery and intensive postoperative treatment carries a grateful result.

## METHODS

This study was conducted for a period of 2 years with a sample size of 60. The sampling was done by stratified random protocol. The study population included all patients above 18 years admitted to surgical wards with a provisional diagnosis of intestinal obstruction. Necessary consent was taken from the patient and relative. Ryle's tube and foley's catheterization was done. Present study was prospective, observational, cross-sectional study.

Duration of the study was September 2013 to September 2015.

- **Particulars of the patient**

- **History**

- **Clinical examination**

- a) General examination: - by noting points on the proforma
- b) Systemic examination: - emphasis on abdominal examination. In abdominal examination, special relevance was given to palpitory finding of guarding. A provisional diagnosis of intestinal obstruction was made.

- **Hematological investigations** All were subjected to a series of blood investigations

- **Total leukocyte count (TLC)** The normal leukocyte count was taken as between 4000 cumm to 11,000 cumm. Any value above 11,000 cumm on admission was considered significant

- **C-reactive protein** It is an acute phase protein. Values of 10mg/l and above on admission were considered significant

- **Radiological investigations**

- a) Roentograms: chest X-ray PA view and X-ray abdomen erect were done. X-ray showing multiple air fluid levels on abdomen erect film was highly suggestive of intestinal obstruction.

- b) USG abdomen and pelvis: This was done to point out any specific etiology, amount of fluid collection, peristalsis and dilatation of bowel loops. More than 500 ml of intraperitoneal fluid was highly relevant.

- c) CT Scan abdomen and pelvis with double contrast: This investigation was carried out in cases of diagnostic dilemma or when further details of a pathological condition were required. A reduction of CT bowel wall contrast enhancement was considered significant.

After collection of complete data based on specific clinical, biological and radiological severity indicators,

scoring was done as follows: - Specific severity indicators<sup>4</sup>: - (one point each)

- Continuous pain in abdomen > 4 days
- Abdominal guarding
- TLC >11000 cells / cumm (on admission)
- CRP >or = 10 mg/l<sup>5</sup>
- USG abdomen and pelvis for free intraperitoneal fluid exceeding 500 ml and/or CT Abdomen showing reduction of computed tomography bowel wall contrast enhancement.

Most of the patients with a score > or = 3 underwent exploration and those <3 were conservatively managed. Based on this individualized severity score an observational study was undertaken to analyze those patients that underwent exploration versus those treated conservatively.

### Surgical management

Immediately after admission, resuscitation with intravenous fluids, especially ringer lactate and normal saline was started till hydration and urine output became normal. Nasogastric decompression with Ryles tube was carried out and antibiotic prophylaxis started. Close observation of all bedside parameters (like pulse rate, BP, RR, urine output, abdominal girth, bowel sounds, tenderness and guarding) was done. Patients who showed reduction in abdominal distension, improvement in general condition and bowel movements especially in individuals with adhesions, conservative management was confined to them.

Patients with clear-cut signs and symptoms of severe acute obstruction were managed by appropriate surgical procedure after resuscitation. Histopathological examination of the specimen of resection / biopsy was done whenever necessary.

The postoperative period was monitored carefully and all parameters were recorded hourly or on four hourly basis depending upon the patient's general condition and toxæmia. Any complications if any, were noted and treated accordingly. Postoperative follow up was done in majority of the patients up to 6 months.

### Statistical methods

Chi-square test, mean and standard deviation were used to evaluate the importance of different severity indicators of obstruction with early recognition, diagnosis and thus timely abdominal exploration.

$$\sum (O_i - E_i)^2 / E_i$$

$\chi^2$  =, Where O<sub>i</sub> is observed frequency and E<sub>i</sub> is Expected frequency.

### Statistical analysis

The statistical software namely SPSS 16.0 was used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables, etc.

### RESULTS

In the present study 60 patients were included, all above the age of 18 years.

**Table 1: Age-wise distribution of patients.**

Age group (years)	Number	Percentage (%)
18-28	09	15
29-39	09	15
40-50	14	23.33
51-61	15	25
>61	13	21.66
Total	60	100

Table 1 shows the age distribution in the study population. In this study, 9 (15 %) of the total patients belonged to age groups 18-28 and 29-39 each, while the maximum representation was from age group 51-61 i.e. 15 (25%).

**Table 2: Sex-wise distribution of patients.**

Sex	Number	Percentage (%)
Male	39	65
Female	21	35
Total	60	100

Table 2 shows sex-wise distribution of patients in the present study. Majority of patients in the study were males, i.e. 39 (65 %). The remainder was made up by females, i.e. 21 (35 %).

**Table 3: Symptom distribution of patients.**

Symptoms	Number (out of 60)	Percentage of total patients (%)
Abdominal pain for >4 days	32	53.33
Vomiting	47	78.33
Constipation	52	86.66
Lump	04	6.66
Distension	54	90
Others	22	36.66

Table 3 shows the various symptoms related to intestinal obstruction with which the patients presented with. 54 (90 %) patients presented with distension, with the other common symptoms being constipation, i.e. 52 cases (86.66%) and vomiting, i.e. 47 cases (78.33%). 32 patients (53.33%) presented with relevant complaints of abdominal pain of more than 4-days duration.

**Table 4: History of previous abdominal surgery in patients.**

Previous surgery	Number	Percentage (%)
Yes	20	33.33
No	40	66.66
Total	60	100 %

Table 4 shows the magnitude of patients that previously underwent a major abdominal surgery. 40 (66.66%) patients in this study had no previous history of abdominal surgery.

**Table 5: Distribution of patients based on management and TLC.**

TLC (per cumm)	Conservative	Surgery	Total
=<11000	19 (48.7%)	20 (51.3%)	39
>11000	6 (28.6%)	15 (71.4%)	21
Total	25	35	60

Table 5 shows distribution of patients based on their management with respect to their total leukocyte count. Out of 21 patients having leukocytosis, 15 (71.4%) underwent surgery.

**Table 6: Distribution of patients based on management and CRP.**

CRP (mg/l)	Conservative	Surgery	Total
<10	18 (58.1%)	13 (41.9%)	31
=/≥10	7 (24.1%)	22 (75.9%)	29
Total	25	35	60

Table 6 shows distribution of patients based on their management with respect to their CRP values. Out of 29 patients having positive CRP values, 22 (75.9%) underwent surgery.

**Table 7: Blood investigations done in study.**

Investigation	Mean	SD	P value
TLC >11000/cumm	17361.9	6010.6	t=8.91
TLC <=11000/cumm	7895.1	2119.2	P=0.000 significant
CRP =/≥10 mg/l	15.31	5.21	t=9.94
CRP <10 mg/l	6.00	0.00	p=0.000 significant

Table 7 shows the two main blood investigations i.e. total leukocyte count and C-reactive protein, carried out in this study. The mean value and standard deviation of these investigations were calculated. The P value of both the data was statistically significant.

Table 8 shows the distribution of patients based on the mode of presentation, i.e. acute, subacute or chronic. 28 (46.66 %) patients presented sub acutely, while the

minimum mode of presentation was chronic, i.e. 07 cases (11.66%).

**Table 8: Distribution according to mode of presentation.**

Mode of presentation	Number	Percentage (%)
Acute	25	41.66 %
Subacute	28	46.66 %
Chronic	07	11.66 %
Total	60	100 %

**Table 9: Distribution of patients according to causes.**

Causes of obstruction	Number	Percentage (%)
Adhesions	20	33.33
Internal hernia	01	1.67
Bands (extraluminal)	04	6.67
Mesenteric ischaemia	07	11.67
Sigmoid volvulus	05	8.33
Peritonitis	03	5
Paralytic ileus	04	6.67
Koch's abdomen	05	8.33
Carcinoma	05	8.33
Appendicular perforation	03	5
Stricture (non-tuberculous)	02	3.33
Intussusception	01	1.67
Total	60	100

Table 9 shows the distribution of patients according to the various causes of intestinal obstruction. One third of the cases i.e. 20 (33.33%) were due to adhesions.

Other causes were mesenteric ischemia, i.e. 7 (11.67%), Koch's abdomen, i.e. 5 (8.33%), sigmoid volvulus, i.e. 5 (8.33%) and carcinoma (8.33%).

Table 10 Shows distribution of patients in this study based on severity score and their management i.e. whether conservative or surgical. 24 patients (66.66%) having a score less than 3 were managed conservatively, while 23 patients (95.83 %) having a score of 3 or more were operated on. The data was statistically significant.

**Table 10: Distribution of patients according to the severity score of obstruction.**

Score	Surgery	Conservative	Total
<3	12	24	36
=>3	23	01	24
Total	35	25	60

Chi square test value= 23.14, degrees of freedom (d.f) =1, p=0.0000015 significant.

Table 11 shows the relation between various etiological factors and their management, whether conservative or surgical. 16 (80 %) of the 20 patients having adhesions were managed conservatively. Most of the other causes of intestinal obstruction required a surgical approach.

**Table 11: Relation of etiological factors with management.**

Causes of obstruction	Management		
	Conservative	Surgical	Total
Adhesions	16	04	20
Internal hernia	00	01	01
Bands (extraluminal)	00	04	04
Mesenteric ischaemia	00	07	07
Sigmoid volvulus	00	05	05
Peritonitis	00	03	03
Paralytic ileus	04	00	04
Koch's abdomen	05	00	05
Carcinoma	00	05	05
Appendicular perforation	00	03	03
Stricture (non-tuberculous)	00	02	02
Intussusception	00	01	01
Total	25	35	60

Table 12 shows relation of various surgical procedures carried out based on the etiology. Resection anastomosis

was the most commonly performed surgical procedure, i.e. 16 (45.7%), followed by adhesiolysis, i.e. 5 (14%) and band excision, i.e. 4 (11.42%).

**Table 12: Various surgical procedures undertaken according to etiological factors.**

Causes of obstruction	Surgical procedures (total 35)								
	Adhesio-lysis	R. A	Band lysis	Colo-stomy	Ileo-stomy (loop)	Internal hernia reduction	Jeju-stomy	Appendicectomy	Cholecystectomy
Adhesions	04	00	00	00	00	00	00	00	00
Internal hernia	00	00	00	00	00	01	00	00	00
Bands (extraluminal)	00	00	04	00	00	00	00	00	00
Mesenteric ischaemia	00	06	00	00	00	00	01	00	00
Sigmoid volvulus	00	04	00	01	00	00	00	00	00
Peritonitis	01	01	00	00	00	00	00	00	01
Paralytic ileus	00	00	00	00	00	00	00	00	00
Koch's abdomen	00	00	00	00	00	00	00	00	00
Carcinoma	00	02	00	02	01	00	00	00	00
Appendicular perforation	00	00	00	00	00	00	00	03	00
Stricture (non-tuberculous)	00	02	00	00	00	00	00	00	00
Intussusception	00	01	00	00	00	00	00	00	00
Total	05	16	04	03	01	01	01	03	01

Table 13 shows the postoperative complications in study patients. There were no complications noted in 43 (71.7%) cases, while death occurred in 9 (15%) cases. Wound infection was present in 2 (3.3%) patients and other complications were negligible.

Table 14 shows outcomes of study patients with respect to various etiologies of intestinal obstruction. Death was the most significant complication and occurred in 9 cases (15%). 4 (44.44%) deaths occurred due to mesenteric ischemia. Deaths were also due to sigmoid volvulus, i.e. 2 (22.22%), carcinoma, i.e. 2 (22.22%) and others.

**Table 13: Postoperative complications in study patients.**

Complications	Number	Percentage (%)
Absent	43	71.7%
Wound infection	02	3.3%
Burst abdomen	01	1.7%
Bowel fistula	01	1.7%
Death	09	15%
Others	04	6.7%
Total	60	100%

**Table 14: Relation of etiological factors with outcomes.**

Causes of obstruction	Complication						
	Absent	Burst abdomen	Death	Fistula	Infection	Others	Total
Adhesions	19	00	00	00	01	00	20
Internal hernia	01	00	00	00	00	00	01
Bands (extraluminal)	03	00	00	00	00	01	04
Mesenteric ischaemia	01	00	04	01	00	01	07
Sigmoid volvulus	02	01	02	00	00	00	05
Peritonitis	01	00	01	00	00	01	03
Paralytic ileus	04	00	00	00	00	00	04
Koch's abdomen	05	00	00	00	00	00	05
Carcinoma	02	00	02	00	01	00	05
Appendicular perforation	03	00	00	00	00	00	03
Stricture (non-tuberculous)	01	00	00	00	00	01	02
Intussusception	01	00	00	00	00	00	01
Total	43	01	09	01	02	04	60

## DISCUSSION

The present prospective observational study was carried out in our institute. 60 patients above 18 years admitted to the surgical wards with a provisional diagnosis of intestinal obstruction were taken for this study.

### Age incidence

Intestinal obstruction although occurs in all age groups, the age spectrum in our clinical study was above 18 years. The study showed peak incidence in the age group 51-61 of 25% and 40-50 years of 23.33% which is comparable with the previous studies by Adhikari S et al, Cole GJ et al (Table 15).<sup>6,7</sup>

### Sex Incidence

In Adhikari S et al, study male to female ratio was 4:1. In Osuigwe AN et al, study male to female ratio was 2:1.<sup>9</sup> In current study male to female ratio is 1.85:1 which is like that of other studies.

**Table 15: Age incidence of intestinal obstruction in different studies.**

Age group (years)	Cole GJ <sup>6</sup>	Souvik Adhikari <sup>7</sup>	Harban Singh <sup>8</sup>
12-20	10%	9%	10%
21-30	10%	11%	16%
31-40	18%	15%	18%
41-50	16%	24%	15%
51-60	15%	13%	10%
61-70	16%	20%	20%
71-80	9%	8%	5%
81-90	6%	4%	4%

### Etiology

The cause of intestinal obstruction differs in different geographical locations. In present study of 60 cases of intestinal obstruction, 33.33 % of the cases were due to adhesions (Table 16).

**Table 16: Comparison of etiology with other studies.**

Cause	Souvik Adhikari <sup>7</sup>	Jahangir <sup>10</sup>	Arshad M. Malik <sup>11</sup>	Cole GJ <sup>6</sup>	Brooks and Butler <sup>12</sup>	Playforth <sup>13</sup>	Present study
Adhesions	16%	49%	41%	10%	23%	54%	33.33%
Internal hernia	36%	34%	19%	35%	25%	23%	1.67%*
Volvulus	6%	5%	4%	3%	1%	3%	8.33%
Tuberculosis	14%	1%	24%	3%	-	-	8.33%
Malignancy	17%	3%	2%	9%	5%	9%	8.33%
Intussusception	2%	6%	-	12%	18%	5%	1.67%
Mesenteric ischaemia	9%	2%	10%	-	-	6%	11.67%

\*As study excluded obstructed abdominal hernias, the incidence of hernias was very low. Internal herniation was included in the study.

In this study, adhesion was the commonest cause of intestinal obstruction, which is comparable with the other study groups, Brooks and Butler with 23% and Arshad Malik et al. with 41%. Incidence of mesenteric ischaemia was also comparable to Adhikari S et al. study with 9% and Malik A et al, study with 10 %.<sup>11,12</sup>

### Clinical features

The common clinical features of intestinal obstruction are abdominal pain, vomiting, constipation and abdominal distension. Abdominal lump, bleeding per rectum etc are other rare features. Not all are present in a patient. Pain abdomen was present in 53.33% of cases, whereas vomiting in 78.33% cases. Distension was

present in 90% and constipation in 86.6 % of the cases. The comparative table shows percentage of clinical features in various other studies (Table 17). In the present study, the clinical features of vomiting (78%), constipation (86.66%) and distension (90%) were comparable with the other study groups like Adhikari S et al, and Khan JS et al.<sup>10</sup>

Abdominal pain was present only in 53.33% cases. This data would have occurred as we considered pain of at least 4 days duration. Abdominal lump was present on palpation only in 6.66% cases of the total study. Lump was mainly seen in cases of volvulus, tuberculosis and intussusception. The rectal examination did not reveal any abnormality except in 1 case of malignancy where rectal growth was present.

**Table 17: Comparison of clinical features with other studies.**

<b>Study</b>	<b>Pain abdomen</b>	<b>Vomiting</b>	<b>Distension</b>	<b>Constipation</b>
Present study	53.33%	78.33%	90%	86.66%
Souvik Adhikari <sup>7</sup>	72%	91%	93%	82%
Jahangir- Sarwar Khan <sup>10</sup>	100%	92%	97%	97%

The finding of guarding on abdominal palpation cannot be ignored. Localised tenderness indicates impending or established ischaemia. The development of peritonism or peritonitis indicates impending or overt infarction and/or perforation. In this study 16 out of 17 patients with guarding were operated.

#### **Laboratory investigation**

Total leukocyte count and C-reactive protein were given emphasis. A TLC of more than 11,000 per cumm and a CRP of 10 mg/l or more was considered significant. Patients with bowel ischaemia often have marked leucocytosis. In present study, out of 21 patients having leucocytosis, 15 (71.4%) underwent surgery.

Salem et al, reviewed the diagnostic value of CRP in true surgical patients with acute abdominal pain in the emergency department.<sup>14</sup> They concluded that CRP alone is not useful in differentiating between surgical causes of acute abdomen or other self-limiting condition. In current study, most of the patients with a positive CRP value were operated on. Hence, CRP can be used as a severity indicator and is of value in deciding the timing of surgery. In this study, out of 29 patients having positive CRP values, 22 (75.9%) underwent surgery.

#### **X-ray**

The erect Abdomen X-ray helps us in the diagnosis of intestinal obstruction as well as in differentiating the small bowel from large bowel obstruction. Multiple air fluid levels can be seen in small bowel obstruction whereas only gas shadows are seen in large bowel obstruction until the ileocecal valve is competent. Taneja et al. report shows 90% of cases with multiple air fluid level and Savage et al. reports 95% cases with significant findings. In the present study 70% of X-ray shows multiple air fluid levels.

#### **Ultrasonography**

In present study 21 patients on USG had free intraperitoneal fluid exceeding 500 ml and 20 (95.23%) of them were operated. Ogata and associates reported that an akinetic, dilated loop of bowel observed on real-time USG has a high sensitivity (90%) and specificity (93%) for the recognition of strangulation; the positive predictive value was 73%. The presence of free peritoneal fluid was also sensitive for strangulation.<sup>17</sup>

#### *CT scan abdomen and pelvis*

In present study 8 of the 10 patients in whom CT scan was performed underwent surgery. CT was used only when there was a diagnostic dilemma or to know the specific cause of obstruction. Sheedy et al noted that with CT, sensitivity was 15% and specificity 94% for identifying bowel ischaemia prospectively in patients with small bowel obstruction.<sup>18</sup> Jancelewicz et al found that decreased bowel wall enhancement on CT, leucocytosis, and peritoneal signs were the only independent predictors of strangulation obstruction on a multiple logistic regression analysis.<sup>19</sup>

#### **Management based on severity scoring system**

Every subject was given a score based on various parameters of the study. Whether the patient was conservatively managed or operated on was further analysed by using the scoring system. Maximum score was 5 and minimum 0. Score of 3 or more was significant. 24 patients (66.66%) having a score less than 3 were managed conservatively, while 23 patients (95.83 %) having a score of 3 or more where operated on.

A similar study was conducted by university hospital, Geneva titled “prospective multicentre validation of a clinic radiological score for predicting the severity of strangulated small bowel occlusion”.

Six variables correlated with small bowel resection and were given one point each towards the clinical score. The risk of intestinal ischaemia was 6 per cent in patients with a score of 1 or less, whereas 21 of 29 patients with a score of three or more underwent small bowel resection. A positive score of 3 or more had a sensitivity of 67.7 per cent and specificity 90.8 per cent. This allows early identification of strangulated SBO.<sup>20</sup>

#### **Surgical management**

The surgical management for the present study group includes release of adhesions, resection and anastomosis for many cases of bowel strangulation where the viability of the bowel was doubtful and for ischaemic bowel, malignancy, strictures, release of constricting agents like band, derotation of volvulus and sigmoidoscopy. Resection anastomosis was performed in 16 patients, adhesiolysis in 5, stoma creation in 5 and band release in 4, out of the 60 patients in our present study.

### Complications

Postoperative complications commonly occur in obstruction patients. Wound infection, burst abdomen, bowel fistula and death due to respiratory tract infection, septicaemia etc are a few common complications encountered. In the present study of 60 cases, complications like death occurred in 9 cases, wound infection in two, burst abdomen and bowel fistula in one each. Death occurred mostly due to septicaemia especially in mesenteric ischaemia cases, those that presented late and patients with other comorbid conditions (Table 18).

**Table 18: Mortality rate in various studies.**

Studies	Year	No. of cases Studied	Mortality (%)
Present study	2014-2015	60	15%
Souvik Adhikari <sup>7</sup>	2005	367	7.35%
Sufian Matsu Moto <sup>15</sup>	1975	171	19%
Jahangir-Sarwar Khan <sup>10</sup>	2001	100	7%
Ramachandran CS <sup>16</sup>	1982	417	12.7%

The mortality rate in the present study is much comparable to Ramachandran CS et al. Study but it is more when compared to Adhikari S et al., Jahangir et al. studies. The mortality in intestinal obstruction is more in patients who develop strangulation and gangrene of the bowel, also who reached the hospital late. With all these, the age of the patient, general condition of the patient, duration of symptoms and operative procedures carries a prominent role in progress as well as the mortality.

### CONCLUSION

Bowel obstruction continues to be one of the most common abdominal problems faced by general surgeons. Irrespective of the cause, it remains a major cause of morbidity and mortality.

Success in the treatment of intestinal obstruction depends largely upon early diagnosis, skillful management and treating the pathological effects of the obstruction just as much as the cause itself.

Early recognition and aggressive treatment are crucial in preventing irreversible ischemia and transmural necrosis and thereby in decreasing mortality and long-term morbidity.

The evaluation of patients with suspected bowel obstruction endeavors not only to confirm the diagnosis but also to determine the need for and timing of surgery.

Certain severity indicators and scoring systems can help to optimize this timing of surgery and prevent mortality.

This study tries to use a severity scoring system to help identify the ideal time to intervene in a case of intestinal obstruction. Most of the severity indicators have been found to be useful.

Despite multiple recent advances in diagnostic imaging and marked advances in our treatment armamentarium, intestinal obstruction will continue to occur.

Hence, our search for such severity markers is necessary to prevent delay in operative intervention and thus prevent mortality and improve outcome of patients.

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